the entire Araneomorphae—"from what tiny seeds the mighty acorn grows." Nevertheless, many avenues remain to be explored. In the words of the editor, "This is a book of questions." Many remain unanswered. I have no doubt that it will stimulate many new and exciting hypotheses for testing.

The highlights for me were Fred Coyle's chapter summarising data on the Mygalomorphae and Mesothelae (Liphistiiidae) and presenting his own observations alongside them. Coyle's work, as ever detailed and thorough, is the only such compilation on the much neglected Mygalomorphae. Finally, we see excellent photographs of the diplurid webs that trap a fascinating variety of prey and remain difficult to adequately describe. Equally, Jonathan Coddington's photographs of the diverse webs of the many orb-weaving spider genera provide ample support for his complex and hard argued hypotheses.

Only one thing detracted from the book. The taxonomic glossary provides much appreciated respite from the barrage of names. However, there are numerous errors in it. The Anyphaenidae and Amaurobioidae are listed separately and not crossreferenced. *Cethegus,* an Australian diplurid, steals from the Panamanian *Diplura* the title of being the most aerial of web-building mygalomorphs. The Liphistiidae are deemed to be "not clearly related to the Mygalomorphae or Araneomorphae," the only other spider groups. However, Platnick and Gertsch's (1976) hypothesis about the groups' relationships remains uncontested. I guess others are also present but do not significantly detract from the notion of a glossary or its function.

Overall, I was thoroughly delighted with "Spiders. Webs, Behavior, and Evolution." The style and content lend themselves to reading by all arachnophiles, not just the academics and other professionals. Generally, the editing is very good, the book is a credit to Shear. I unreservedly recommend the volume.—*Robert J. Raven, Queensland Museum, PO Box 300, South Brisbane, 4101, Q. Australia.*

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Evolution and Adaptation of Terrestrial Arthropods.—John L. Cloudsley-Thompson. 1988. Springer-Verlag, Berlin, Heidelberg, New York. x + 141 pp. $33.00 paper.

This slim volume is designed to present "a concise synthesis of certain basic information required for BSc (Hons) and MSc (Entomology) examinations" (author's preface), with a functional emphasis. The nine chapters cover (1) paleontology and phylogeny, (2) implications of life on land, (3) conquest of land by Crustacea, (4) insect phylogeny and origin of flight, (5) evolutionary trends in reproduction, (6) adaptations to extreme environments, (7) dispersal and migration, (8) defensive mechanisms, and (9) success of terrestrial arthropods. These are indeed important areas of functional and evolutionary entomology, ones with recent exciting discoveries

and conceptual advances. A concise and up-to-date synthesis of these topics would be welcome. Unfortunately, this book does not provide that synthesis.

This book will be unintelligible to those who lack a thorough background in formal entomology. Anatomical terms and arthropod names are used without definition, description, or illustration, and concepts lack proper introduction as to their significance for understanding arthropod evolution. The book is poorly edited, with typographical errors on nearly every page and numerous misstatements of fact. The chapters are not well integrated, and there is insufficient recognition of important research since 1980. Cloudsley-Thompson's decision to present little physiology and no biochemistry weakens his functional approach. The 86 line drawings are mostly modifications of previously published illustrations, typically of whole arthropods, that visually enhance the text but do not help in its clarification. The slender bibliography for each chapter (median of 14 references, 3 since 1980) provides only a cursory introduction to the literature. All but three of the chapters (1, 4, and 9) are the topics of earlier books or reviews by this prolific author, which may explain the peripatetic nature of themes grouped under "evolution and adaptation."

Cloudsley-Thompson devotes much attention to Sidnie Manton's theories of the evolution of Arthropoda, including diphyletic origin of mandibles, multiple origins of arthropodization, and myriapod-hexapod relationships. In contrast to Manton, he concludes that Arthropoda and Onychophora are separate phyla, the former containing the subphyla Uniramia, Crustacea, and Chelicerata, largely relying on the evidence provided in Gupta (1979).

He concludes that the paranotal lobe theory of the origin of wings is the most widely held today but that Kukalova-Peck's (1978) theory of wing origin from pleural gill plates is equally plausible. At one point, he considers the Paleodictyoptera to be the oldest and most primitive order of insects, having "generalized biting jaws" and comprising "an assemblage of primitive types" which gave rise to the Paraplecoptera and from them the Embioptera and Isoptera. However, in the next paragraph the Paleodictyoptera are correctly said to "have highly modified piercing and sucking mouthparts" and "were not ancestral to any modern insect orders." Similar self-contradictions and non-sequiturs occur frequently in this book.

Wing venation is analyzed according to Lameere's and Tillyard's modifications of the Comstock-Needham system, without recognition of Wootton's (1979) important analysis or discussion of Kukalova-Peck's (1978, 1985) hypotheses based on paleozoic fossils. The "Panorpoid complex" is said to include all endopterygote orders except the Hymenoptera and Coleoptera, following Tillyard, instead of the more widely accepted concept of Hinton which also excludes the neuropteroid orders. Throughout Cloudsley-Thompson's discussion of arthropod evolution, there is no explicit use of a phylogenetic (Hennigian) approach and no new hypotheses as to systematic groupings or evolutionary lineages.

Discussion of adaptations, especially those concerning reproduction, largely ignores the current revolution in sexual selection theory, neglecting even such important concepts as male-male competition and female choice. The primary functions of courtship are said to be appeasement and synchrony. The function of male swarming is implied to be unclear, and perhaps representing "a habit which has persisted long after its original function has disappeared" (p. 58). Courtship feeding by *Panorpa* scorpionflies is said to divert the female, with no recognition of Randy Thornhill's

important studies on female choice in Mecoptera. Mating in *Calopteryx* damselflies is described without mention of Jonathan Waage's studies on removal of previously deposited sperm by the penis. While R. Thornhill and J. Alcock's *The Evolution of Insect Mating Systems* (Harvard University Press, 1983) is cited in the bibliography, it appears to have been ignored in the preparation of the chapter on reproduction.

Migration and dispersal are better presented, with documentation of inconspicuous as well as conspicuous migrations and acceptance of the adaptive value of leaving adverse conditions to the migrants themselves. However, monarch butterflies do *not* have some members of their population overwintering near the Canadian border; the presentation of the seasonal cycle of aphids is garbled; and there is no mention of phases of migratory locusts and little discussion of alary polymorphism in general and the environmental and physiological factors that control it.

The short concluding chapter on success of terrestrial arthropods stresses the significance of the chitinous exoskeleton, small size, short life cycle, and "genetic adaptability," which have enabled colonization of every conceivable terrestrial habitat. Morphological adaptation is illustrated by the evolution of sucking mouthparts in insects and vertebrate ectoparasitism in ticks and insects. This chapter, regrettably, mirrors the entire book—a tantalizing peek at an important subject, not so much erroneous as incomplete and out-of-touch with modern evolutionary biology.—*George C. Eickwort, Department of Entomology, Comstock Hall, Cornell University, Ithaca, New York 14853.*

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Evolution and Adaptation of Terrestrial Arthropods.—John L. Cloudsley-Thompson. 1988. Springer-Verlag, New York, New York, 141 pp. $33 (paper).

The phylum Arthropoda comprises, by far, the largest group of organisms on Earth. From their first appearance in the early Cambrian Period (570–480 million years before present), arthropods have radiated to fill ecological niches in virtually every corner of the globe, the Crustacea reigning supreme in many marine habitats, while insects dominate the land. It is on land that the importance of the group is manifest. In terms of species diversity and numbers of individuals, the arthropods (the vast majority of which are insects) control the nature of life on the land surface; they are